EPA Response to Washington Waterfowl Association's Comments Dated 1/25/13
Re: Technical Review of Pacific Groundwater Group Hydrogeologic Evaluation of Proposed Leque Island Restoration Report

EPA has reviewed the comments provided by Washington Waterfowl Association on the "Hydrogeologic Evaluation of Proposed Leque Island Restoration Report" done by the Pacific Groundwater Group (PGG). Washington Waterfowl Association provided approximately 16 pages of specific comments. Accordingly, all comments regarding hydraulic head levels and salinity measurements and interpretation of data should be directed to PGG.

A summary of Waterfowl Association's key comments and EPA's responses are listed below.

1. Comment: It seems environmental factors (very wet spring and related elevated groundwater recharge), and selected groundwater model factors (salinity, drain cells, distant groundwater withdrawals over a mile from the monitoring area, purported septic and irrigation recharge through glacial till, tidal runoff above 7.1 ft, sea level rise, etc.) all result in underestimation of the potential for effects of Leque Island restoration on Camano Island drinking water; more specifically, an underestimation of salinity and hydraulic head level on Leque Island and overestimation of long-term groundwater elevations underlying the Camano Island uplands. The PGG study didn't use realistic and or measured parameters in the model.

Response: Given the information/data availability and budget, a sound groundwater flow modeling approach was implemented. Additional model runs can address the effects of seasonality (e.g., dry vs. wet period), conservatively higher, post-restoration groundwater levels at Leque Island, and higher than the implemented 9 gpm average annual groundwater withdrawal. Measured, site-specific parameters may improve model calibration, but the incremental gains by the calibrated model would unlikely predict a reversed groundwater flow direction beneath Camano Island.

2. Comment: A groundwater study was conducted, but essentially none of the groundwater model inputs were measured for Leque Island.

Response: Additional site-specific data may result in improved model performance, but the incremental gains will be local and are unlikely to alter the predicted flow direction from Camano Island towards low lands (Davis slough and Leque Island).

3. Comment: Regardless of use of non-conservative model input conditions and lack of consideration of long-term changes on a restored Leque Island, the groundwater model still shows groundwater flow into the protected Sole Source Drinking Water Aquifer from Leque Island.

Response: The PGG study does not support this assertion. The groundwater model predicts that post-restoration flow is from Leque Island toward the monitoring site as a discharge area.

4. Comment: The groundwater study/model is temporally static, and does not consider long term changes in Leque Island groundwater levels, sea level rise, and groundwater salinity as a result of the proposed restoration.

Response: The groundwater model was set up to evaluate on annually-averaged basis the impact on groundwater flow direction after the restoration project was completed. The potential impact of higher groundwater water levels at Leque Island has been addressed by PGG using supplemental model runs, which predict Leque Island head values would need to range from 3.1 to 7.1 feet above current estimate of post-restoration heads to cause significant regional reversals of flow. These groundwater head increments would be highly unlikely to occur year around.

5. Comment: An unusually wet spring of 2012 may have resulted in higher than normal groundwater elevations underlying Camano Island.

Response: This wet period should also apply to Leque Island and may have resulted in higher than normal groundwater elevations underlying Leque Island. A dry period would result in lower than normal groundwater levels in both Islands. In any case, additional model runs can conclusively address the impact of drought vs. wet periods. PGG provided additional model runs which demonstrated highly conservative drought conditions of pumping and precipitation recharge under which groundwater flow under Camano Island uplands is reversed. Groundwater flow reversal was predicted under highly unlikely drought conditions and pumping rates.

6. Comment: The study does not meet the original EPA study design requirements.

Response: EPA's review concludes that the study did meet the design parameters originally provided by EPA.

7. Comment: Assumptions for the groundwater salinity and elevations/flow are not conservative enough to represent actual conditions.

Response: The developed model is a groundwater flow model and does not simulate salinity. Model outputs therefore are not influenced by any assumptions on salinity. Conditions simulated by the model represent expected actual conditions. Conservative scenarios have been investigated by PGG in supplemental model runs.

Additional Comments: EPA noted other comments that deserve specific acknowledgement. These are listed below. All of these comments pertain to modeling assumptions and input parameters which mostly have been addressed by PGG in supplemental model runs.

- Steady-state model and lack of consideration of seasonal variations and inter-annual variability (wet vs. dry years). PGG addressed this concern through additional drought scenario model run.
- The likelihood formation of the postulated post-restoration, drainage efficient ditch network. The Battelle Hydrodynamic model estimates that the bottom shear stress distribution in the restoration site is smaller that the critical shear stress value of 0.1 Pa for erosion to occur during most of tidal cycle; this points toward a depositional environment and channel siltation. PGG conducted additional model runs on clogging of ditches.
- The use of larger than 5 hours of post-restoration Leque Island inundation as a conservative scenario worth further exploration within a risk-assessment scheme. The tidal conditions (inundation depth and duration) at the north Leque Island may be a reflection of the conditions during post-restoration. PGG provided supplemental model runs to address the effect of higher inundation depths.

- The possibility of saltwater intrusion from North Leque to the monitoring area, thus explaining higher groundwater salinities in the monitoring site.